

Stopping the Threat of Anti-Microbial Resistance



**President's Council of
Advisors on Science and
Technology**

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Sciences, Washington DC*

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CDC strategic directions

HEALTH SECURITY



Improve health security at home and around the world

LEADING CAUSES OF DEATH



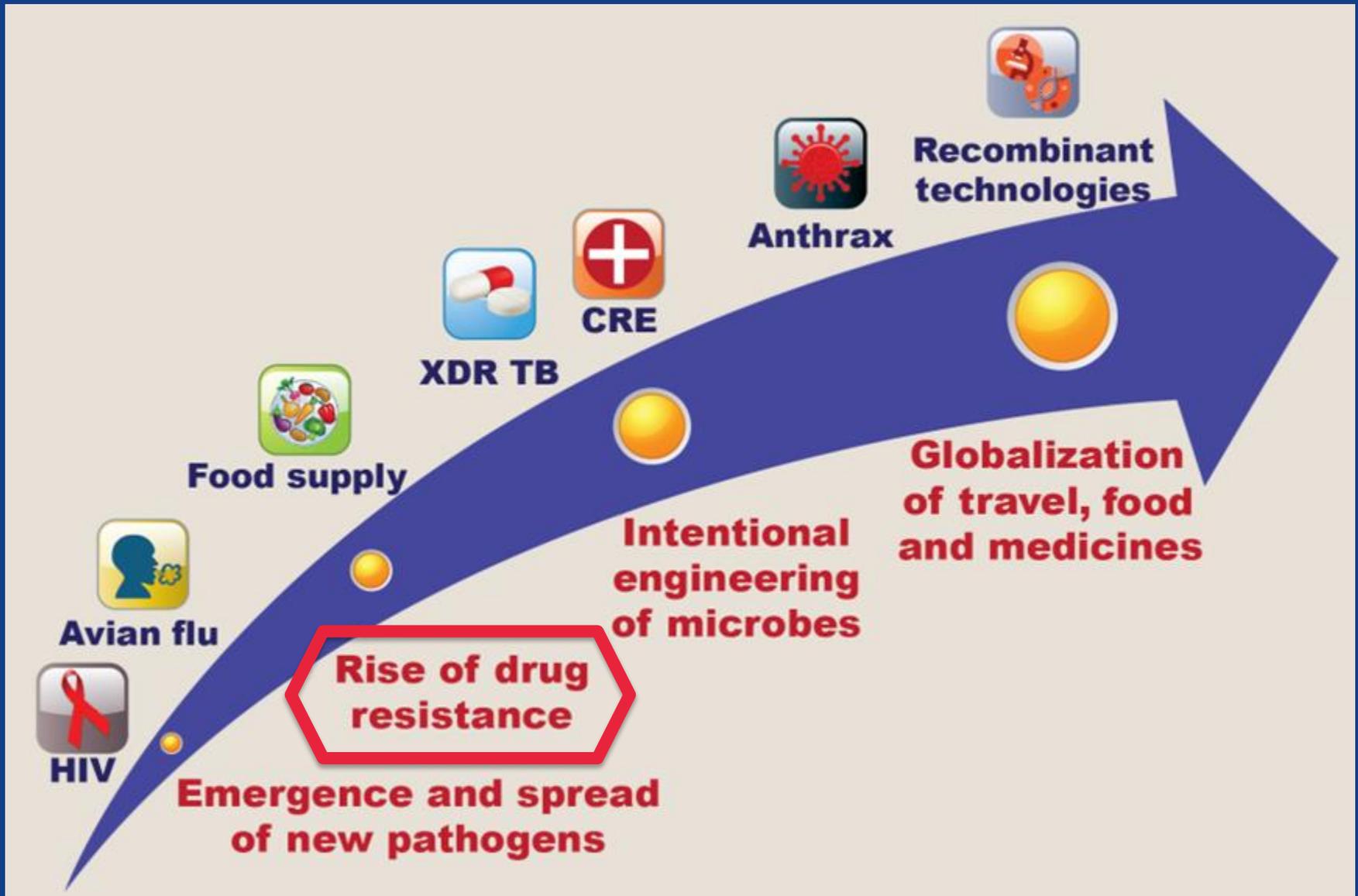
Better prevent the leading causes of illness, injury, disability, and death

PUBLIC HEALTH-HEALTH CARE COLLABORATION



Strengthen public health/health care collaboration

Perfect storm of vulnerability



Key strategies

- Prevent infections
- Track resistant infections
- Improve use of antibiotics (stewardship)
- Find new drugs

Carbapenem-resistant *Enterobacteriaceae* (CRE)



Multidrug-resistant organisms, including CRE, pose a significant public health threat

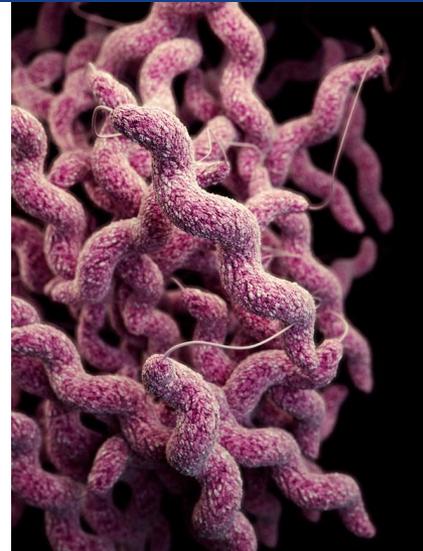
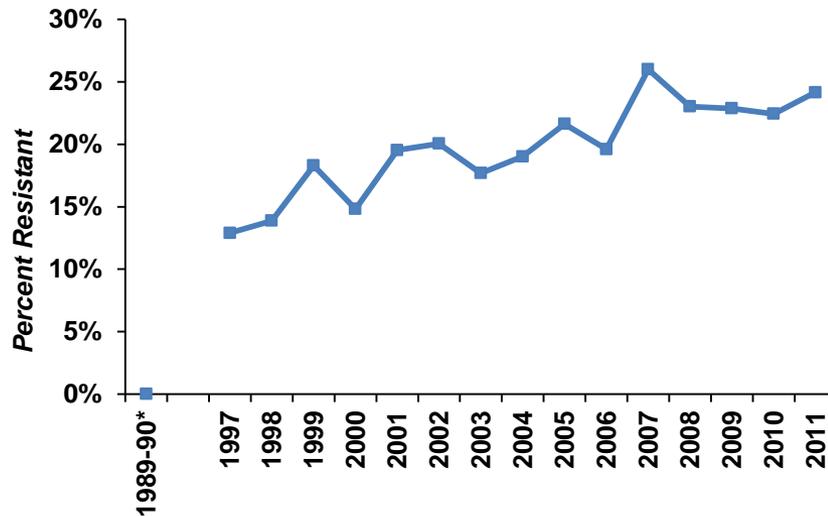
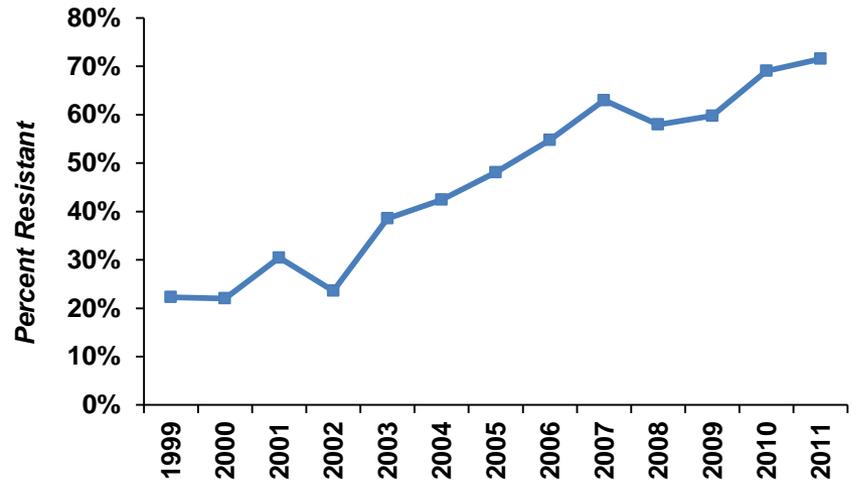
- Most common type of CRE is resistant to almost ALL antibiotics
- New and frightening resistance patterns emerging
- CRE has spread across US – found in one state in 2001, now spread to 38 states

Outbreaks show importance of long-term care, acute care, and nursing homes as source of HAIs in hospitals

- Regional prevention efforts effective in preventing infections (e.g., Chicago, Florida)

Enteric diseases becoming increasingly resistant to antibiotics

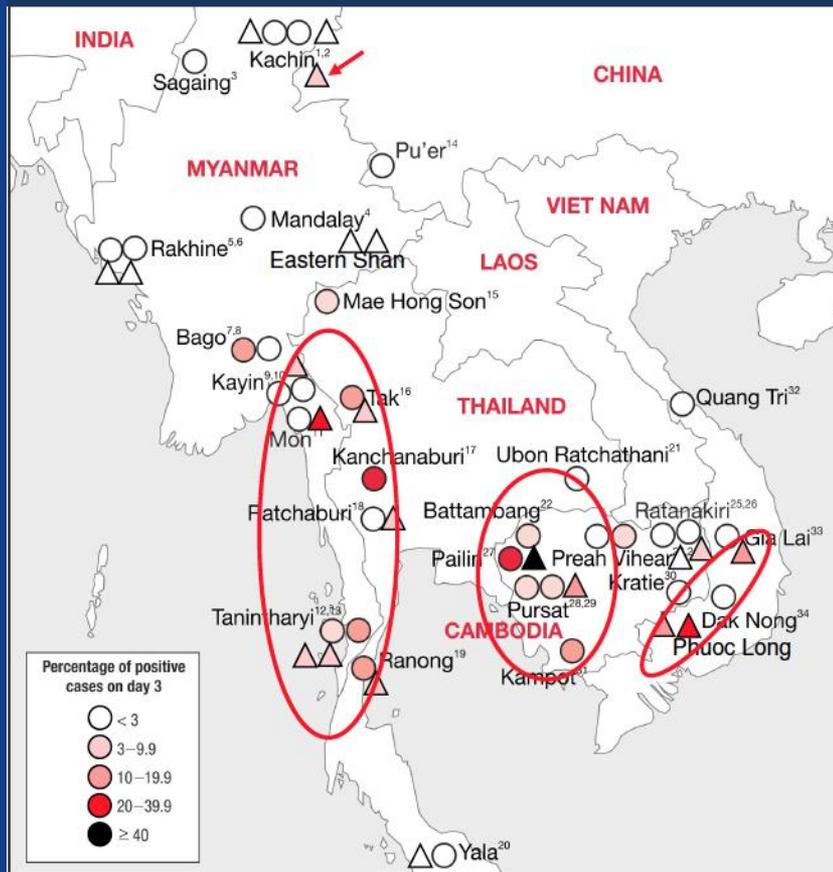
Salmonella Typhi
(typhoid fever)
resistance/partial
resistance to
ciprofloxacin



Campylobacter
resistance to
ciprofloxacin

Antimalarial artemisinin drug resistance is growing in South-East Asia

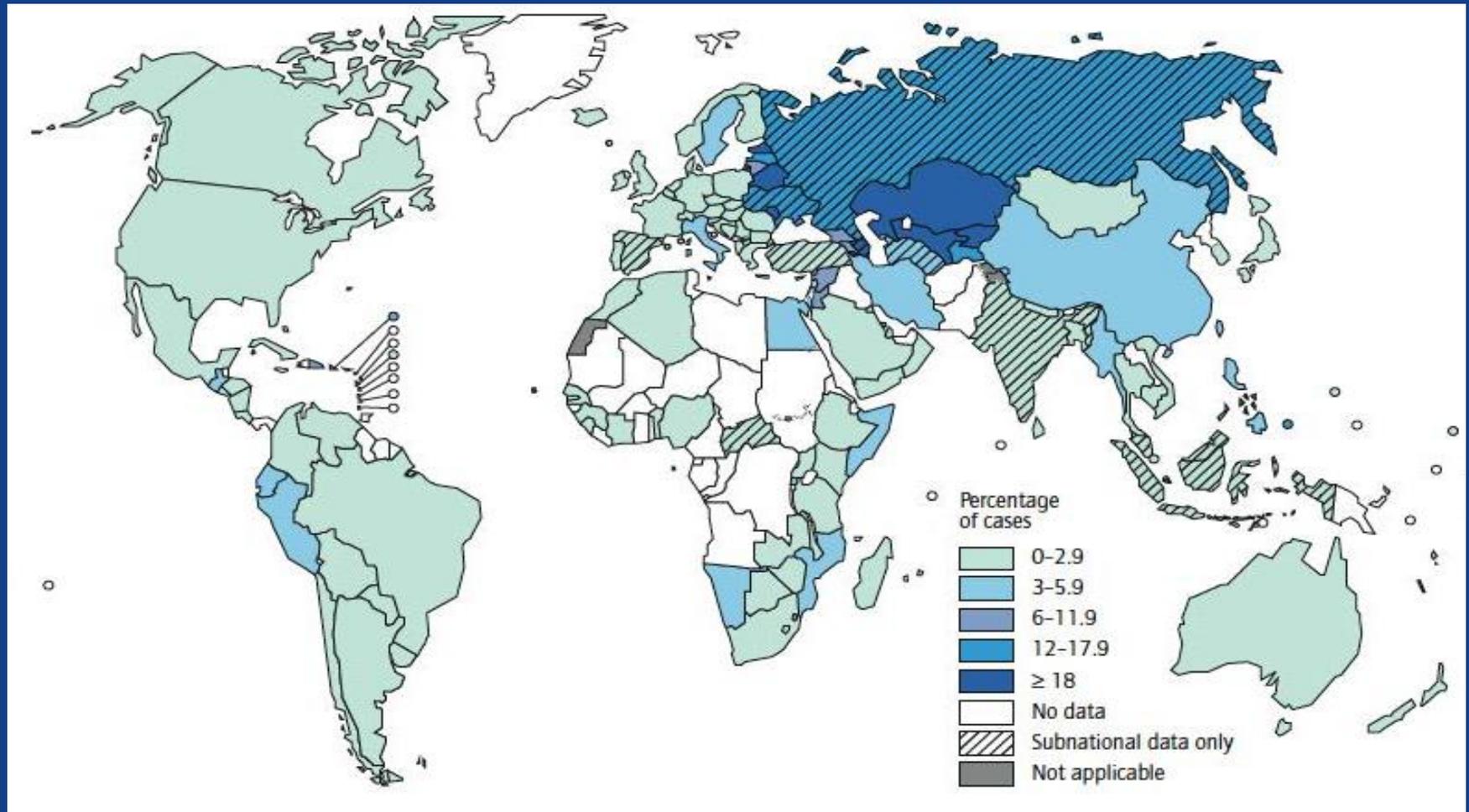
Percentage of cases positive for malaria on day 3 after ACT



- Antimalarial ACT drug therapies increasingly ineffective
- No new drug class expected for >5 years
- Need for better control of malaria to
 - Prevent worsening drug resistance
 - Slow disease spread

WHO. Update on artemisinin resistance, April 2012. Circles represent data before November 2010; triangles data after November 2010.

MDR-TB is a global threat



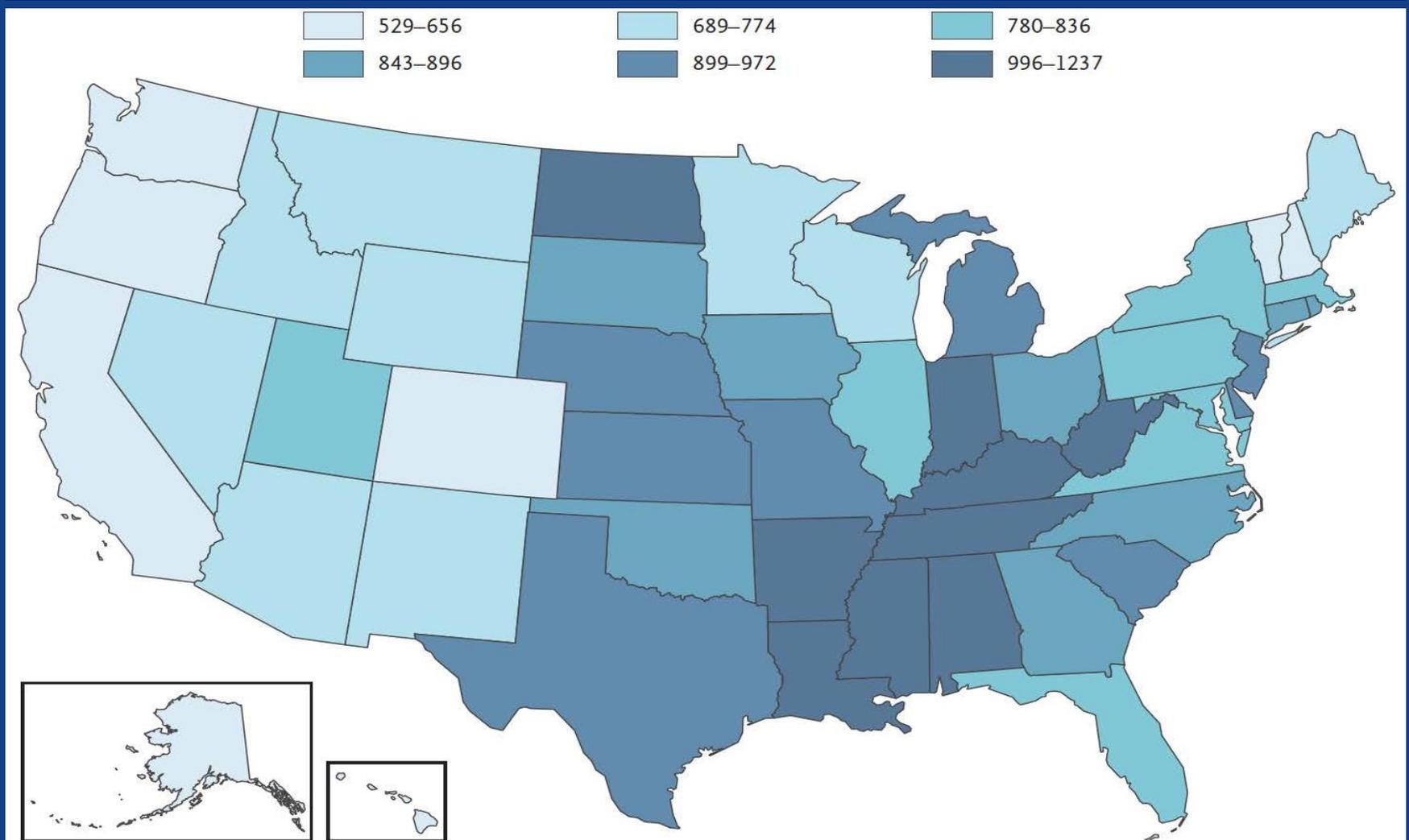
Source: WHO. Rate among previously untreated patients.

Public health strategies can reduce resistance

- Immunization
- Infection control
- Protecting the food supply
- Antibiotic stewardship
- Outbreak detection and control

Rates of prescribing antibiotics vary widely among states

Prescriptions per 1,000 population, 2010

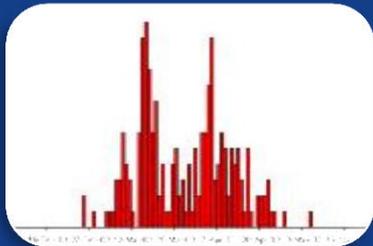


Source: Hicks et al. NEJM 2013;385:1461-2.

Antibiotic stewardship is an effective strategy to prevent AMR

Facility benefits	Antibiotic best practices	Antibiotic stewardship programs are a “win-win”
<ul style="list-style-type: none">• Decrease antibiotic resistance• Decrease <i>C. difficile</i> infections• Decrease costs• Improve patient outcomes	<ol style="list-style-type: none">1. Ensure all orders have dose, duration, and indications2. Get cultures before starting antibiotics3. Take an “antibiotic timeout,” reassessing antibiotics after 48-72 hours	<ul style="list-style-type: none">• A University of Maryland study showed one antibiotic stewardship program saved \$17M over 8 years• Antibiotic stewardship helps improve patient care and shorten hospital stays

Advanced Molecular Detection combines cutting-edge approaches



Traditional epidemiology



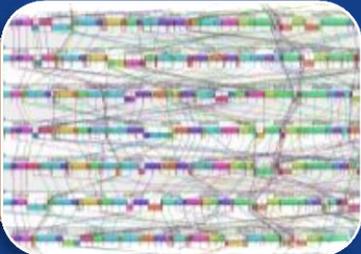
Genomic sequencing



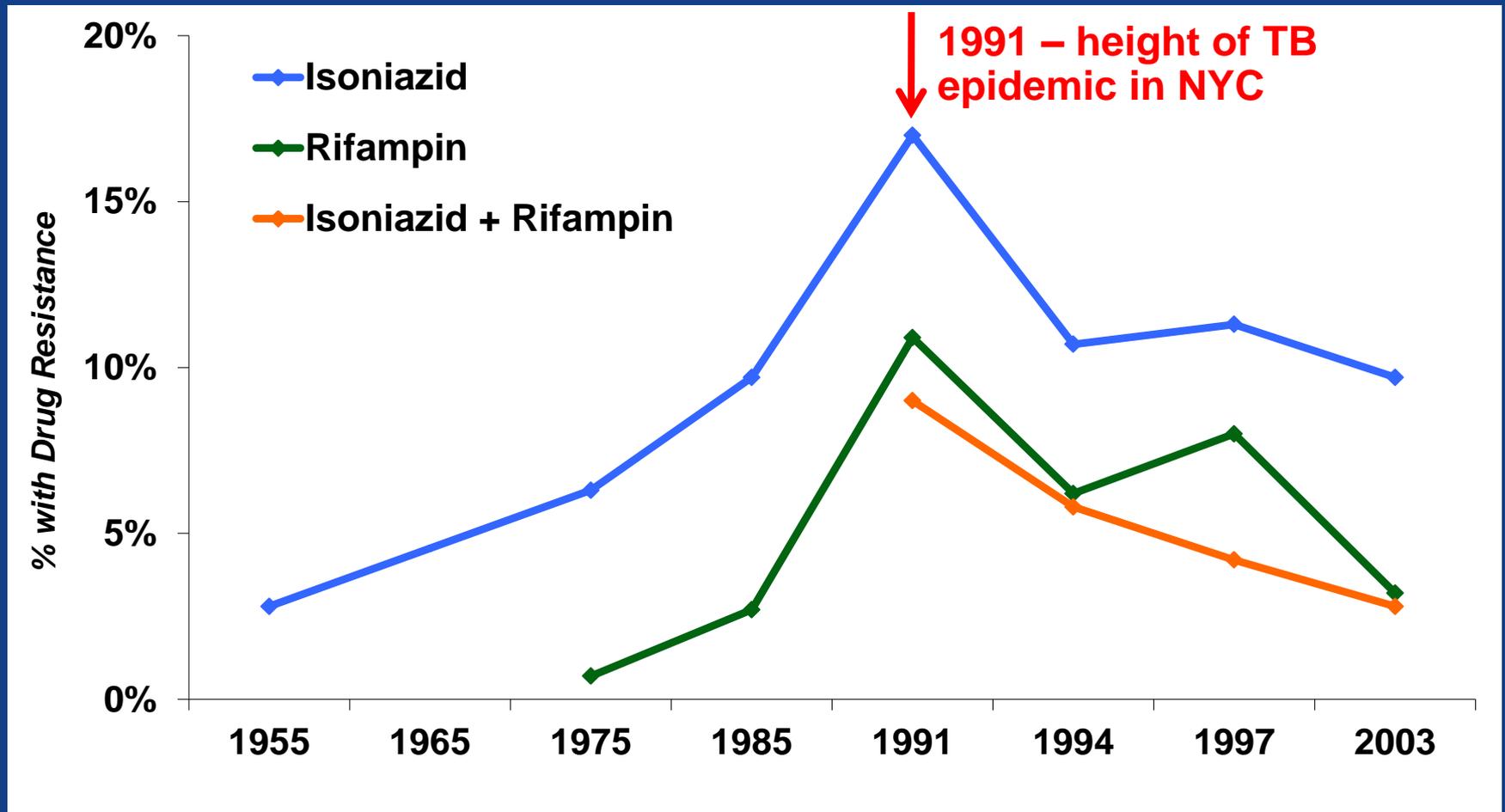
Bioinformatics



Advanced Molecular Detection



Growth and decline of drug-resistant TB NYC, 1955-2003

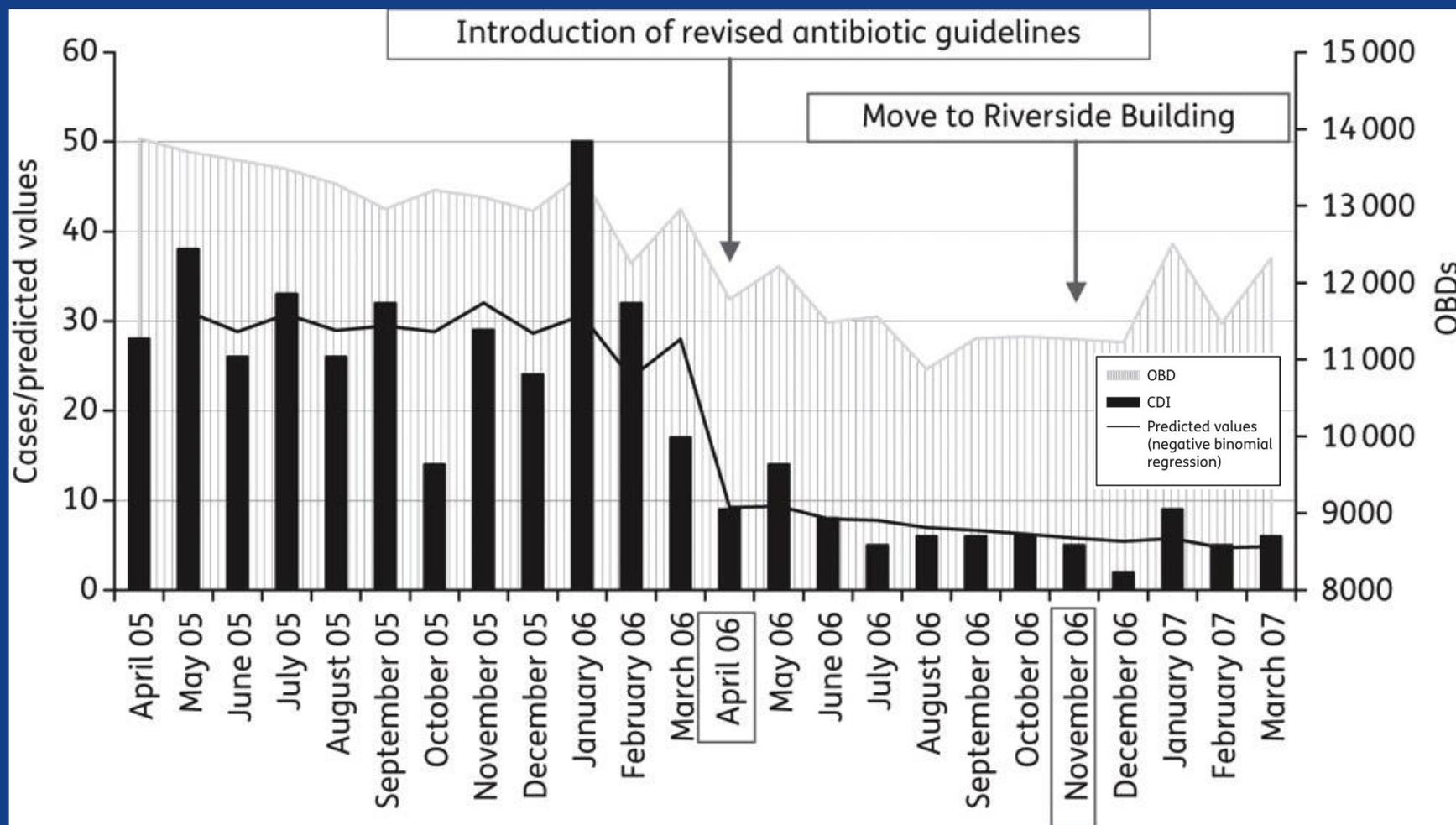


Frieden et al. NEJM 1993;328:521-6.

Munsiff et al. Clin Infect Dis 2006;42:1702-10.

C. diff infections declined sharply after revision of antibiotics guidelines

University Hospital Lewisham, London, 2005-07





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